

WHAT IS CLAIMED IS:

1. A solid-state imaging device, comprising:
 - a pixel array having a plurality of unit pixels, each unit pixel including a photo diode and an insulated gate field effect transistor that detects a photocharge; and
 - a control circuit that controls the operation of the pixel array, wherein:
 - the photo diode and the insulated gate field effect transistor share a well region of a first conductivity type that is formed in a semiconductor layer of a second conductivity type, the semiconductor layer of the second conductivity type formed on a semiconductor substrate of the first conductivity type;
 - the insulated gate field effect transistor comprising:
 - a source diffused region of the second conductivity type formed on a surface of the well region;
 - a drain diffused region of the second conductivity type formed on a surface of the semiconductor layer other than the surface of the well region;
 - a gate electrode formed over the well region between the drain diffused region and the source diffused region with a gate insulating film therebetween;
 - a channel region formed in the surface of the well region under the gate electrode and having an impurity layer of the second conductivity type; and
 - a heavily doped buried layer of the first conductivity type formed under the channel region in the well region and near the source diffused region, having an impurity concentration higher than that of the well region, and being an accumulation region that accumulates a charge of a given conductivity type generated in response to light incident on the photo diode; and
 - the control circuit that applies predetermined voltage to the source diffused region and the gate electrode, respectively, by which the channel region is brought into a conductive state, so as to bias a junction region formed of the semiconductor substrate and the semiconductor layer in a forward direction, and the control circuit accumulates a predetermined amount of the charge of a predetermined conductivity type in the accumulation region thereby, and thereafter, discharges the charge of a predetermined conductivity type accumulated in the accumulation region.
2. The solid-state imaging device according to claim 1, a state where a predetermined amount of the charge of a predetermined conductivity type is accumulated

being a saturated state where a maximum amount of available charge of the predetermined conductivity type is accumulated in the accumulation region.

3. The solid-state imaging device according to claim 1, the charge of the predetermined conductivity type being a hole when the first conductivity type is a P type and the second conductivity type is an N type.

4. The solid-state imaging device according to claim 1, the charge of the predetermined conductivity type being an electron when the first conductivity type is an N type and the second conductivity type is a P type.

5. An image device, comprising:

- a photodiode disposed in a well region of a first conductivity type that is disposed on a semiconductor layer of a second conductivity type that is further disposed on a semiconductor substrate of the first conductivity type;
- an insulated gate field effect transistor that shares the well region with the photodiode, further comprising:
 - a source diffused region of the second conductivity type disposed on a surface of the well region;
 - a drain diffused region of the second conductivity type disposed on a surface of the semiconductor layer other than the surface of the well region;
 - a gate electrode formed above the well region between the drain diffused region and the source diffused region with a gate insulating film therebetween;
 - a channel region disposed in the surface of the well region under the gate electrode having an impurity layer of the second conductivity type;
 - an accumulation region that is heavily doped of the first conductivity type, and that is disposed beneath the channel region and adjacent to the source diffused region, the accumulation region having an impurity concentration higher than that of the well region and that accumulates a charge of a given conductivity type generated in response to light incident on the photodiode; and
 - a control circuit that during an accumulation period applies first predetermined voltages to the source diffused region and the gate electrode to cause the charge to accumulate in the accumulation region, and during a reading out period applies second predetermined voltages to the source diffused region and the gate electrode to discharge the charge in the accumulation region.

6. An image device, comprising:

a photodiode disposed in a well region of a first conductivity type that is disposed on a semiconductor layer of a second conductivity type that is further disposed on a semiconductor substrate of the first conductivity type;

an insulated gate field effect transistor that shares the well region with the photodiode, further comprising:

a source diffused region of the second conductivity type disposed on a surface of the well region;

a drain diffused region of the second conductivity type disposed on a surface of the semiconductor layer other than the surface of the well region;

a gate electrode formed above the well region between the drain diffused region and the source diffused region with a gate insulating film therebetween;

a channel region disposed in the surface of the well region under the gate electrode having an impurity layer of the second conductivity type; and

an accumulation region that is heavily doped of the first conductivity type, and that is disposed beneath the channel region and adjacent to the source diffused region, the accumulation region having an impurity concentration higher than that of the well region and that accumulates a charge of a given conductivity type generated in response to light incident on the photodiode.